

# **High-Definition Multimedia Interface**

**Version 2.0**

**Quantum Data MOI v1.0**

**Test ID: HF1-14**

July 15, 2014

# Preface

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## Document Revision History

1.0 July 15, 2014 – Initial Release.

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## Contact Information

The URL for the HDMI Forum web site is: <http://www.hdmiforum.org/>

The URL for the Quantum Data website is: <http://www.quantumdata.com>.

# Table of Contents

<b>Preface.....</b>	<b>2</b>
<i>Notice.....</i>	<i>2</i>
<b>Document Revision History.....</b>	<b>2</b>
<i>Intellectual Property .....</i>	<i>2</i>
<i>Contact Information .....</i>	<i>2</i>
<b>Introduction .....</b>	<b>4</b>
<b>Scope .....</b>	<b>4</b>
<b>References .....</b>	<b>4</b>
<i>Normative References .....</i>	<i>4</i>
<i>Informative Reference .....</i>	<i>4</i>
<b>Test ID HF1-14: Video Timing – 6G – 2160p 24-bit Color Depth .....</b>	<b>5</b>
<i>Objective .....</i>	<i>5</i>
<i>Reference .....</i>	<i>5</i>
<i>Requirement .....</i>	<i>5</i>
<i>Capability(s) .....</i>	<i>5</i>
<i>Test Equipment .....</i>	<i>5</i>
<i>Generic Procedure.....</i>	<i>5</i>
<i>Vendor Specific Test Procedure .....</i>	<i>7</i>

# Introduction

This document provides a set of Method of Implementation for test method described in HDMI Compliance Test Specification Version 2.0 (HDMI CTS 2.0). HDMI Forum created HDMI CTS 2.0 to specify a set of tests that should be performed to verify features described in HDMI Specification Version 2.0.

## Scope

This document provides testing procedures for HDMI CTS 2.0 Test ID HF1-14: “Source Video Timing – 6G – 2160p 24-bit Color Depth.” The procedure below deals with single resolution and only one Test ID is considered at a time.

## References

### Normative References

High-Definition Multimedia Interface Specification Version 1.4b, October 11, 2011.  
HDMI Compliance Test Specification Version 1.4b, October 11, 2011.  
High-Definition Multimedia Interface Specification Version 2.0, August, 2013.  
HDMI Compliance Test Specification Version 2.0.

### Informative Reference

No additional informative references.

## Test ID HF1-14: Video Timing – 6G – 2160p 24-bit Color Depth

### Objective

Confirm that the Source, whenever transmitting any 24-bit Color Depth 2160p Video Format for TMDS Character Rate above 340Mcsc up to 600Mcsc, complies with all of the required Pixel and line counts.

Table 7-35 Source Video Timing - 6G – 2160p 24-bit Color Depth Requirements

Reference	Requirement
[HDMI: 2.0: 10.1] Use of the AVI InfoFrame in This Specification	<See reference for details>
[HDMI 2.0: Appendix E] Signaling in AVI InfoFrame and VSIF for various Video Formats	<See reference for details>

### Capability(s)

The Source DUT supports the transmission of any 24-bit Color Depth 2160p Video Format for TMDS Character Rate above 340Mcsc up to 600Mcsc.

### Test Equipment

Item	Generic Equipment	Vendor Specific Equipment	Quantity
1	HDMI 2.0 Protocol Analyzer	980 Advanced Test Platform series: 980 HDMI 2.0 Protocol Analyzer module HDMI CTS 2.0 Compliance Test Package #3	1
1	Frequency Counter		1

### Generic Procedure

- 1 If no CDF field Source\_2160p\_Video\_Formats\_Above\_340 is declared, then SKIP this test.

Setup:

- 2 Connect the Source DUT to the Protocol Analyzer.
- 3 Configure the EDID, which indicates all Video Formats necessary for this test.

Measure:

- 4 For each Video Timing listed in CDF field Source\_2160p\_Video\_Formats\_Above\_340, perform the following:
  - 4.1 Operate the Source DUT to output the tested format at a color depth of 24 bits/Pixel. For all of the following, refer to the values listed in Table 7-37 and Table 7-38 for the tested format.
  - 4.2 Measure the TMDS Clock Rate with a frequency counter.

- 4.3 If the TMDS Clock Rate is outside the allowable range, then FAIL.
- 4.4 Capture and descramble the data (except for one unscrambled Control Period per field) and verify the tested format as follows:
- 4.5 From the beginning of the captured data, scan for the first Video Data Period.
- 4.6 For each horizontal line, measure the following values:
- HS\_POLARITY = HSYNC active value.
  - HS\_LEN = number of Pixels that HSYNC remains active.
  - VIDEO\_TO\_HS = number of Pixels from the end of the Video Data Period to HSYNC active edge.
  - H\_ACTIVE = number of Pixels in the Video Data Period minus 2 (for the Guard Band).
  - H\_TOTAL = number of Pixels between two HSYNC active edges.
- 4.7 If any of the values of HS\_POLARITY, HS\_LEN, VIDEO\_TO\_HS, H\_ACTIVE and H\_TOTAL do not equal the correct value for the selected Video Format, then FAIL.
- 4.8 For each field, measure the following values:
- VS\_POLARITY = VSYNC active value.
  - VS\_LEN = number of Pixels that VSYNC remains active divided by H\_TOTAL, rounded to the nearest integer
  - V\_ACTIVE = number of Video Data Periods between two consecutive VSYNC active edges.
  - V\_TOTAL = number of Pixels between the VSYNC active edges divided by H\_TOTAL, rounded to the nearest half-integer.
- 4.9 Measure the following value:
- V\_TOTAL = number of Pixels between the VSYNC active edges divided by H\_TOTAL, rounded to the nearest half-integer.
- 4.10 If any of the values of VS\_POLARITY, VS\_LEN, VS\_TO\_1515 VIDEO, V\_ACTIVE and V\_TOTAL does not equal the correct value for the selected Video Format, then FAIL.

Vendor Specific Test Procedure

Test Equipment

A variety of equipment is needed for testing HDMI products. Each piece is authorized and included by name in this Compliance Test Specification. This section describes the Quantum Data test equipment.

HDMI 2.0 Protocol Analyzer module

The Quantum Data 980 HDMI 2.0 Protocol Analyzer module can be installed in the 980B or 980R series Advanced Test Platforms. This 980 HDMI 2.0 Protocol Analyzer module serves the generic test functions called out in the HDMI 2.0 Generic CTS. Refer to the table below:

Item	Quantum Data Equipment	
1	980 Advanced Test Platform series:	
	Equipped with:	980 HDMI 2.0 Protocol Analyzer module
		HDMI CTS 2.0 Compliance Test Package #3

980 HDMI 2.0 Protocol Analyzer Module with 980 Series Platform Configurations

The figures below show depictions of the 980 HDMI 2.0 Protocol Analyzer module equipped in various 980 series platforms. **Note:** Card positioning may vary depending on configuration.



Source Video Timing – 6G – 2160p 24-bit Color Depth

Test ID HF1-14 - Video Timing – 6G – 2160p 24-bit Color Depth

### 1. Objective

Confirm that the Source, whenever transmitting any 24-bit Color Depth 2160p Video Format for TMDS Character Rate above 340Mcsc up to 600Mcsc, complies with all of the required Pixel and line counts.

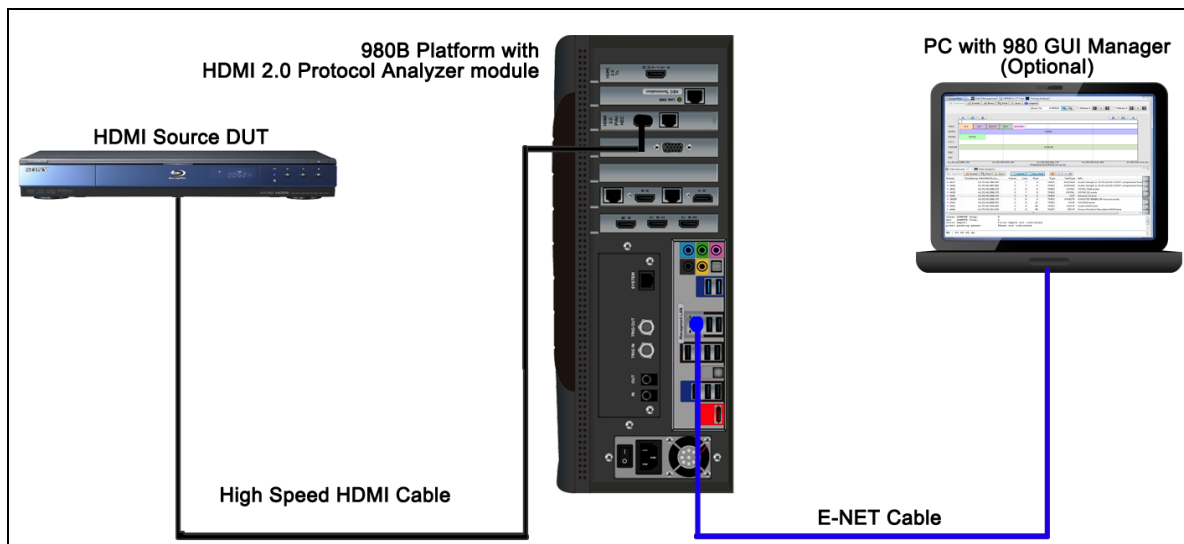
### 2. Test Overview

The Pass/Fail criteria is assessed by the application with no human examination required.

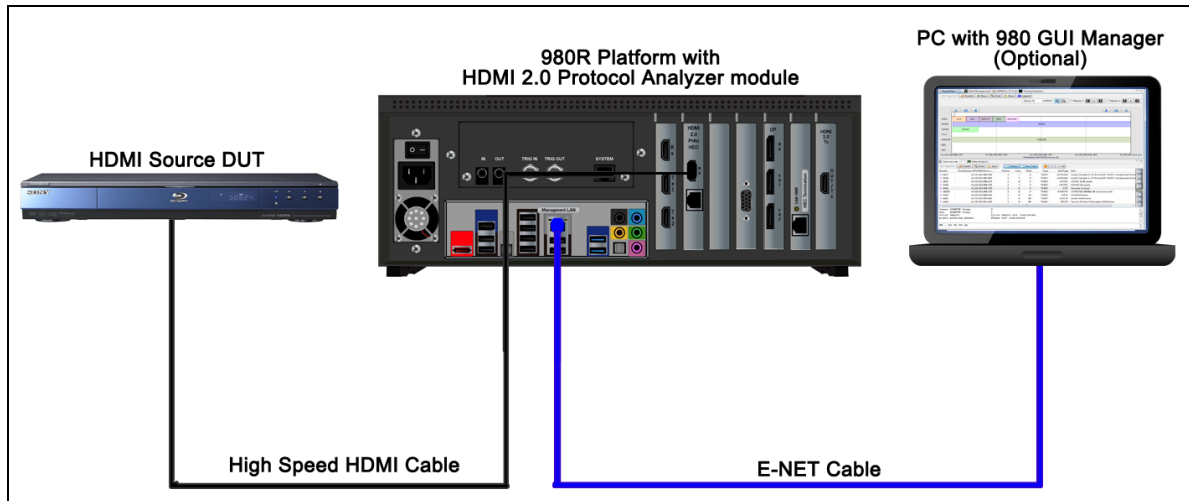
### 3. Procedure

Use the following procedure to conduct this test.

- 1 Connect Source DUT to the Quantum Data 980 HDMI 2.0 Protocol Analyzer at the module's port labeled Rx. Use a High Speed HDMI cable. The figures below show depictions of connections to the 980 HDMI 2.0 Protocol Analyzer module residing in the 980 series chassis.



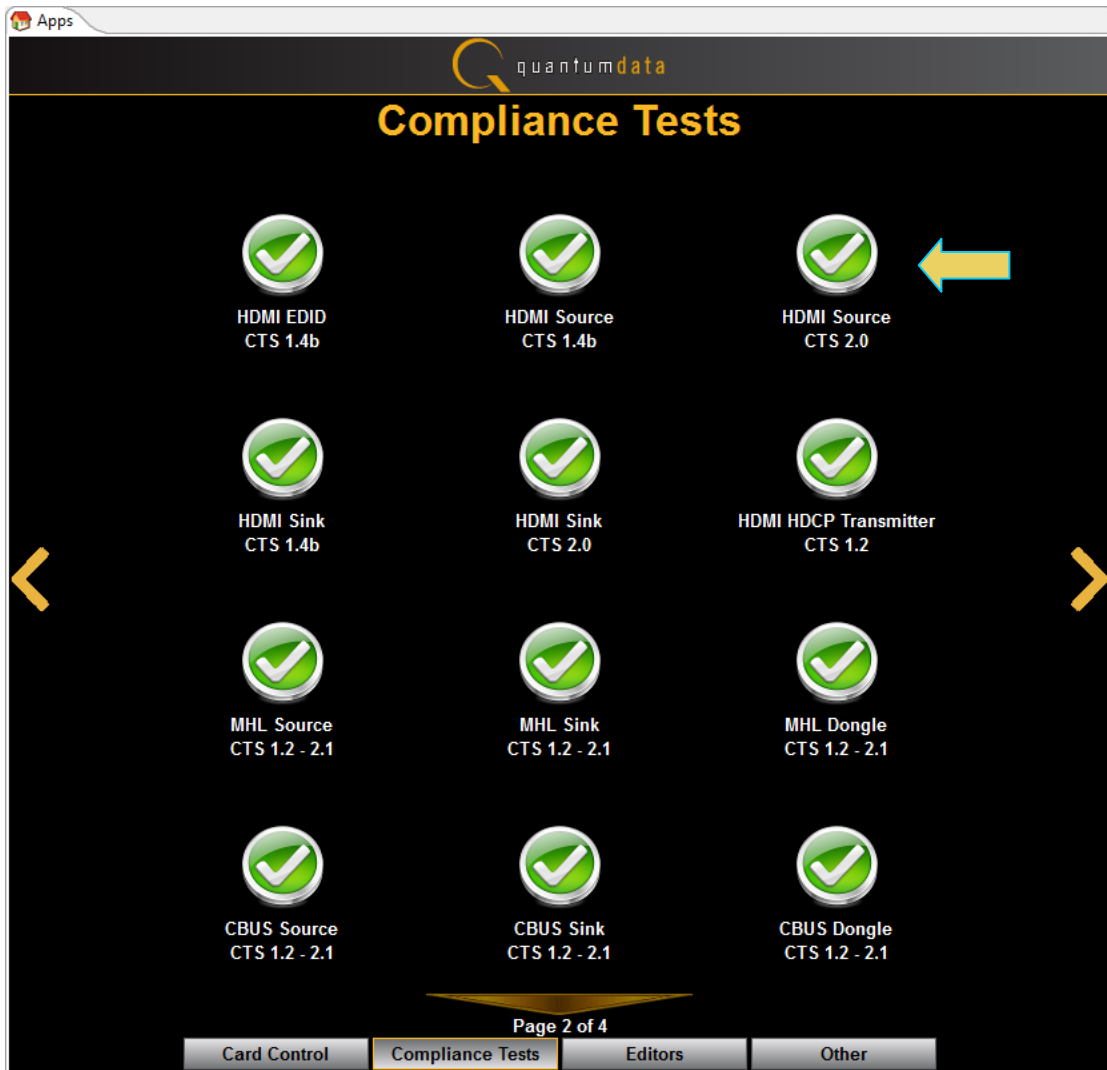




- 2 Operate the Source DUT to output the tested format at a color depth of 24 bits/Pixel. For all of the following, refer to the values listed in Table 7-37 and Table 7-38 of the HDMI CTS.
- 3 Use Quantum Data 980 Embedded Manager GUI (touchscreen) or invoke Quantum Data 980 External Manager GUI (Windows application).

**Note:** You will not need to connect the PC shown in the figures above if you are running the compliance test through the 980's embedded display. The PC running the 980 HDMI 2.0 Protocol Analyzer module's compliance test application is connected to the 980 through a standard Ethernet cable.

- 4 Complete the following steps:
  - 4.1 Click on the HDMI Source CTS 2.0 icon in the Compliance Tests page of the Apps panel.



- 4.2 Navigate to the CDF tab if not already there. If there is a saved CDF file, then click on Open and select it. Otherwise, enter the DUT's CDF information for each tab and optionally click on Save to save the CDF.

HDMI 2.0 Src CT 2.0

CDF Entry Selection Test Options / Preview

Open New Save CDF File: /CDF/XYZ\_Source

General Y420 Video 21:9 (64:27) Video 6G Video non2160p Timings

Source\_ITURBT\_2020\_101 Does the DUT support ITU-R BT.2020 Y'CC'BCC'RC Colorimetry?  
☐ Yes ☒ No

Source\_ITURBT\_2020\_110 Does the DUT support ITU-R BT.2020 Y'C'BC'R Colorimetry?  
☐ Yes ☒ No

Source\_LTE\_340Msc\_Scrambling Does the product support scrambling for TMDS Character Rates at or below 340Msc?  
☐ Yes ☒ No

Source\_Above\_340 Does the product support any Video Format/color mode for TMDS Character Rate above 340Msc up to 600Msc?  
☒ Yes ☐ No

**Source\_2160p\_Video\_Formats\_Above\_340**

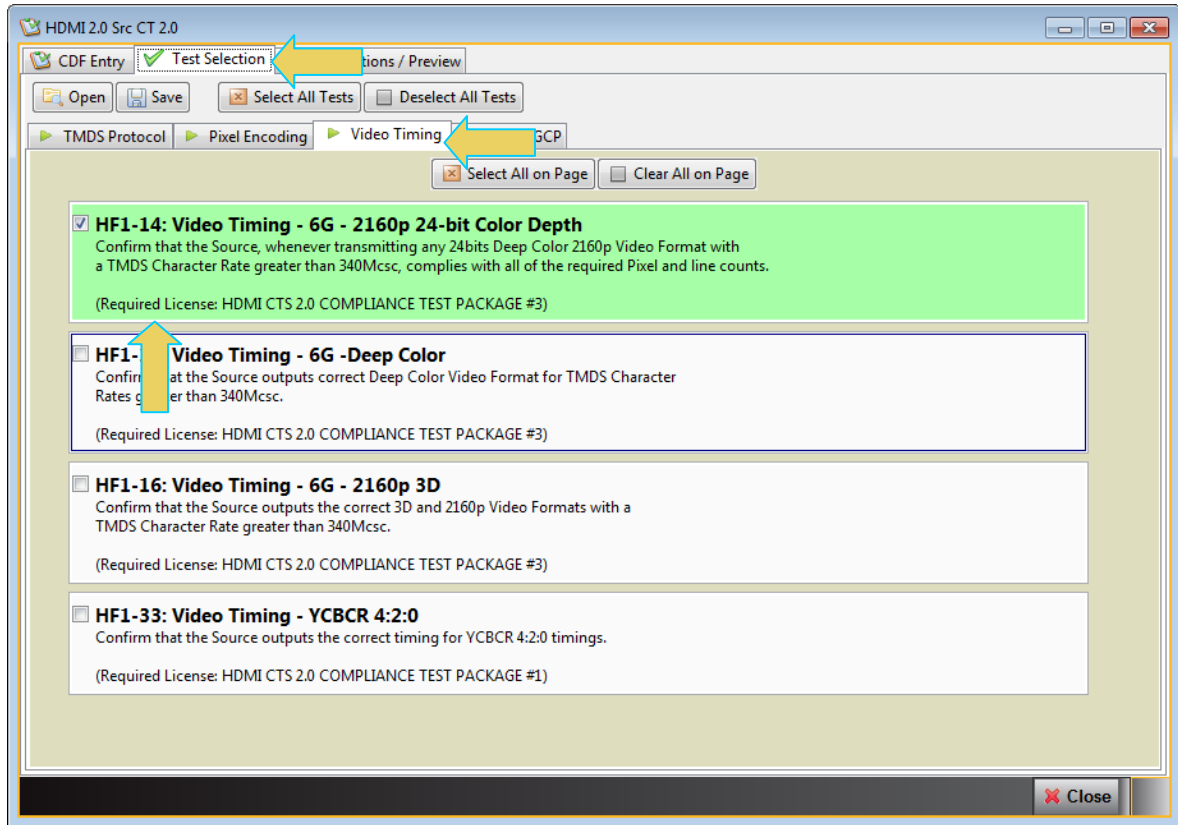
(96) 3840x2160p @ 50 Hz 16:9	<input checked="" type="radio"/> Yes <input type="radio"/> No
(97) 3840x2160p @ 60 Hz 16:9	<input checked="" type="radio"/> Yes <input type="radio"/> No
(101) 4096x2160p @ 50 Hz 256:135	<input type="radio"/> Yes <input checked="" type="radio"/> No
(102) 4096x2160p @ 60 Hz 256:135	<input type="radio"/> Yes <input checked="" type="radio"/> No
(106) 3840x2160p @ 50 Hz 64:27	<input checked="" type="radio"/> Yes <input type="radio"/> No
(107) 3840x2160p @ 60 Hz 64:27	<input checked="" type="radio"/> Yes <input type="radio"/> No

**Source\_2160p\_DC\_Video\_Formats\_Above\_340**

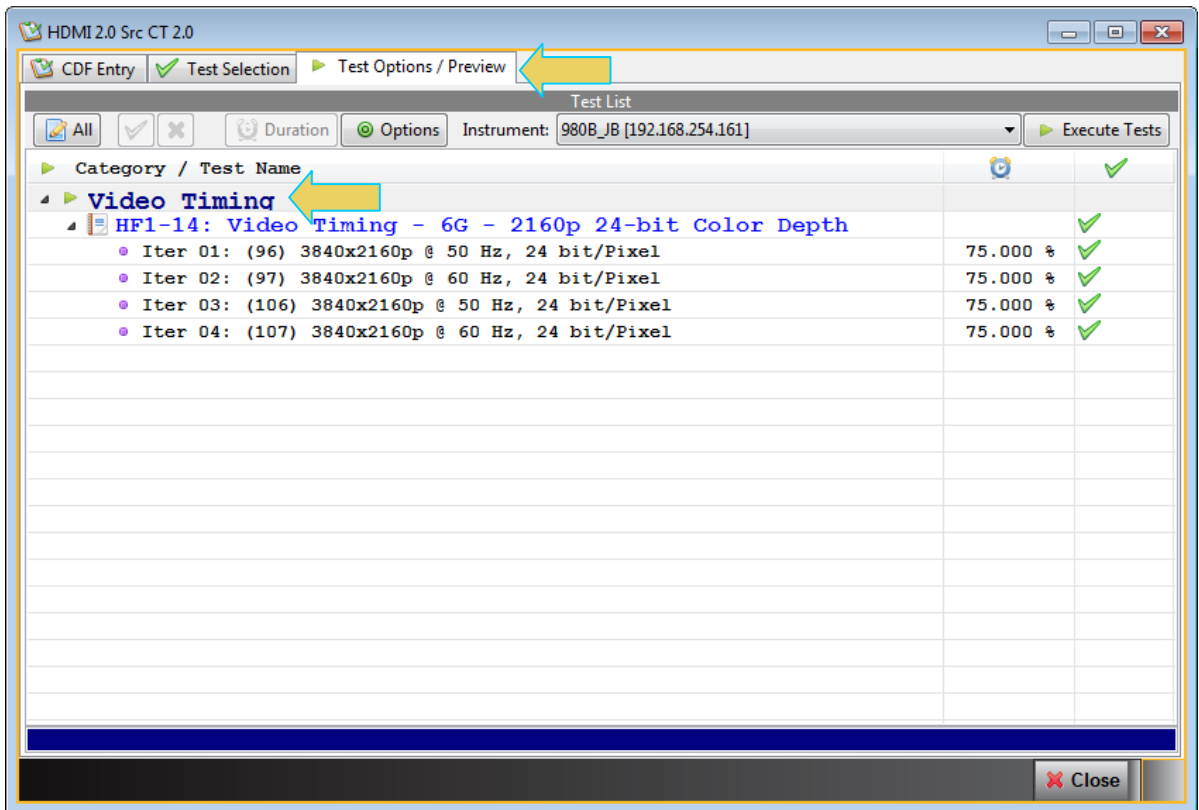
(93) 3840x2160p @ 24 Hz 16:9	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(94) 3840x2160p @ 25 Hz 16:9	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(95) 3840x2160p @ 30 Hz 16:9	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(98) 4096x2160p @ 24 Hz 256:135	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(99) 4096x2160p @ 25 Hz 256:135	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(100) 4096x2160p @ 30 Hz 256:135	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(103) 3840x2160p @ 24 Hz 64:27	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(104) 3840x2160p @ 25 Hz 64:27	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(105) 3840x2160p @ 30 Hz 64:27	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)

Close

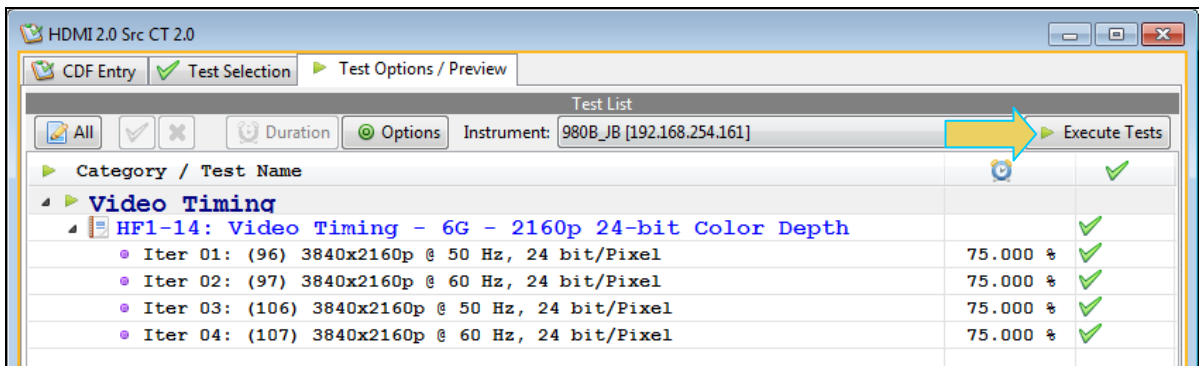
- 4.3 Click on the Test Selection tab and the Video Timing sub tab and select the HF1-14 Video Timing – 6G – 2160p 24-bit Color Depth Test. Refer to the sample screen below.



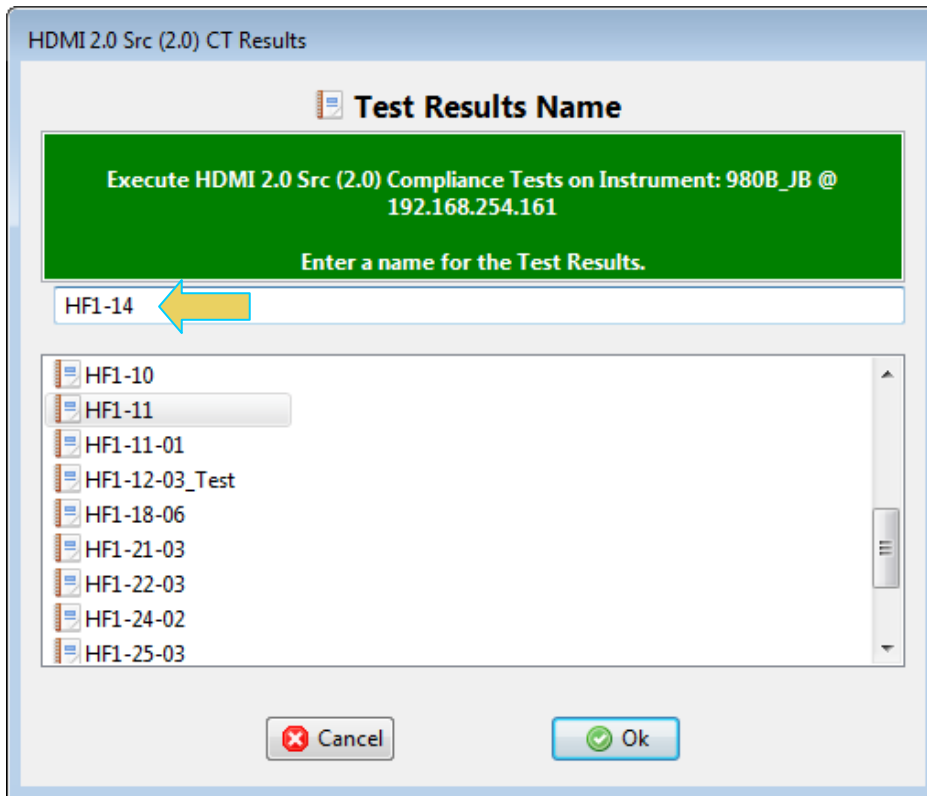
- 4.4 Click on Test Options / Preview tab and review the list of tests. Refer to the sample screen below.



4.5 Click on Execute tests activation button to initiate the test. Refer to the sample screen below.

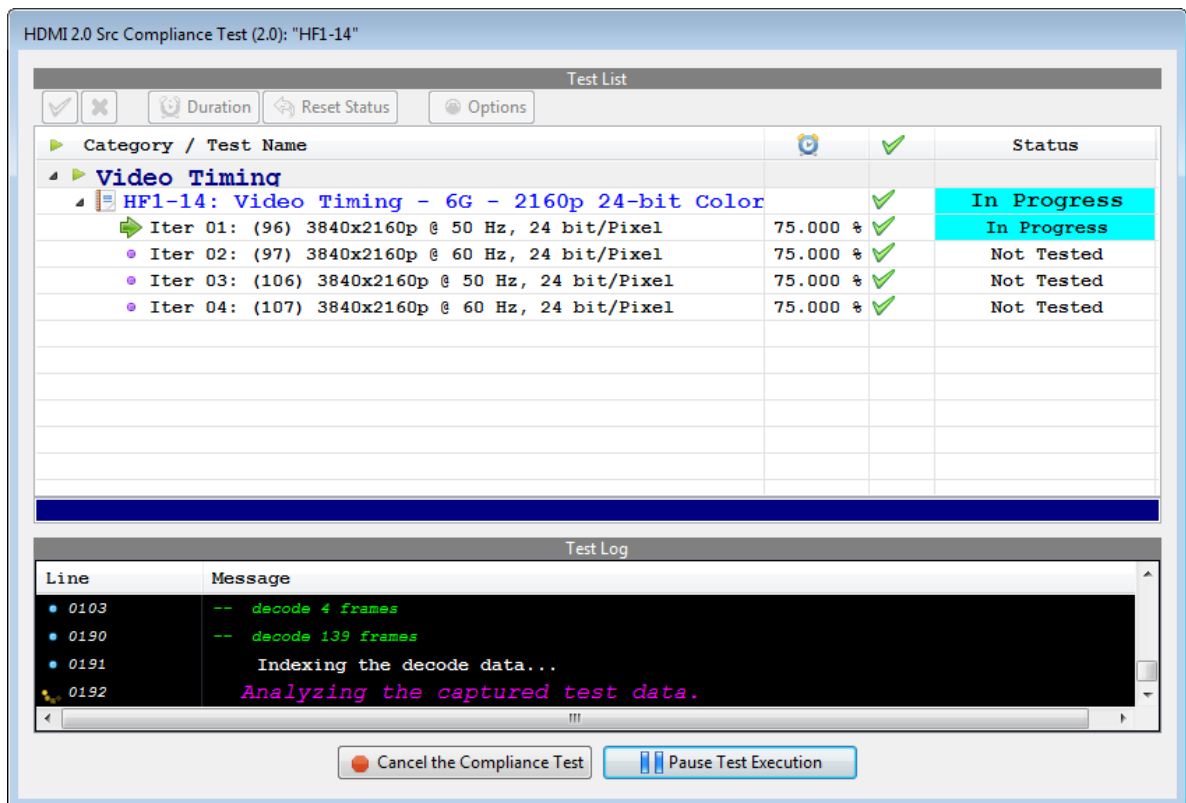


**Note:** You will be prompted with a dialog box to assign a name to the test results. Refer to the screen example below:

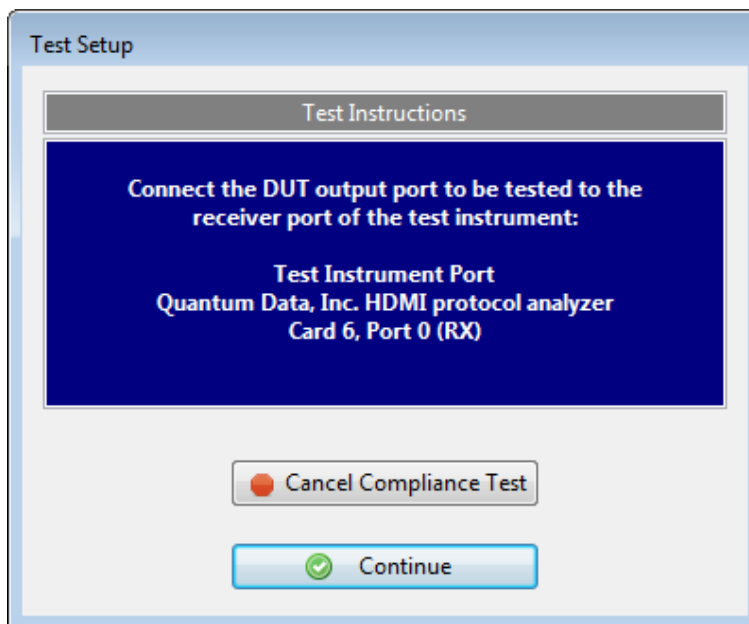


Enter a name, click OK and the test will begin.

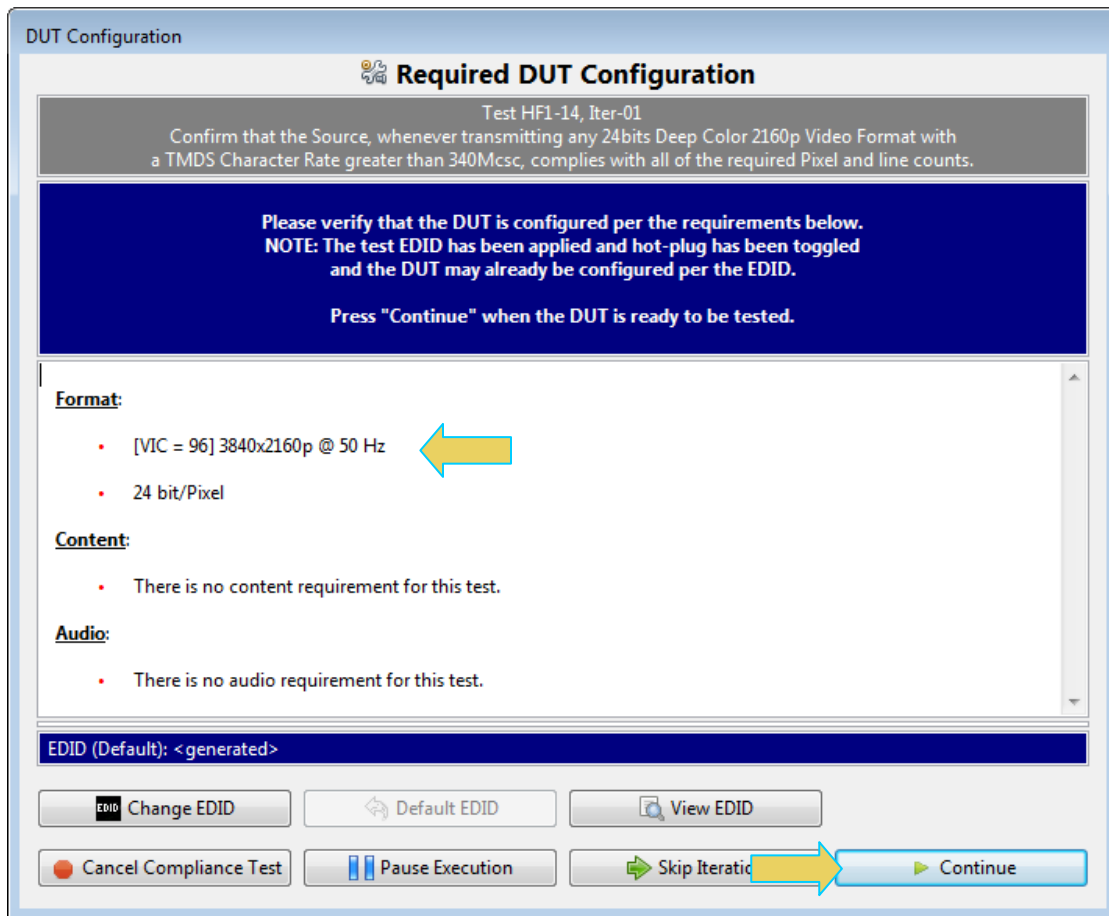
A Test Window will appear (below) indicating the progress of the test.



A Test Window will appear (below) indicating the test setup.



You will be prompted with a series of dialog boxes informing you of the requirements of the source DUT. Verify that the source is outputting the required HDMI format and pixel encoding and press Continue to run the test.



- 5 If the 980 HDMI Protocol Analyzer's compliance test application reports PASS, then PASS.  
If the 980 HDMI Protocol Analyzer's compliance test application reports FAIL, then FAIL.



